

BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division INDUSTRIAL HYGIENE GROUP Standard Operating Procedure: Program Procedure	NUMBER IH105150
	REVISION FINAL Rev0
Subject: Chemical HazMat Emergency Response Personal Protective Equipment	DATE 03/02/04
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1.0 Purpose & Scope

Purpose: The purpose of this procedure is to provide guidance to protect workers using PPE from the presence of chemicals released in emergency response incidents. The value of this SOP is the pre-determination of appropriate actions for use in emergency response releases at BNL. This SOP is a mandatory requirement for IH Group personnel in responding to events. It can be used by IH Group professionals in making recommendations for PPE use by other BNL and non-BNL organizations.

This SOP cannot anticipate all hazards and exposure scenarios that may be encountered in an actual emergency. Thus this SOP does:

- Not establish any mandatory action that must be taken.
- Not limit actions that in the judgment of the IHG personnel are prudent and necessary.
- Not limit the professional judgment of the IH Group personnel responding to an event.
- Not authorize IHG personnel to place themselves or others at an unacceptable or preventable risk, even if the failure to do a particular action (that the IHG personnel at the scene believes is not prudent and safe) would not follow a pre-defined BNL SHSD procedure.

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2.0 Responsibilities

- 2.1 SHSD personnel assigned a role in the BNL Emergency Plan are responsible to act within the defining SOPs established by the IH Group and within the overall requirements in the BNL Emergency Plan and OSHA HazWoper requirements.

3.0 Definitions

none

4.0 Prerequisites

none

5.0 Precautions

Heat Stress is an issue in workers wearing PPE. Follow the prevention measures in the BNL training course *Heat Stress Prevention*.

6.0 Procedure

The IH Group serves as technical advisors to the Incident Commander (IC) at an event. The IH Group performs limited functions in the area with exposure potential under the direction of the Incident Commander.

- 6.1 **Follow IH 105100:** Determining what hazard is involved and the appropriate response action.
- 6.2 **Select the appropriate PPE:** Use the following logic chart in *Attachment 9.1* to select the PPE for the hazard present.
- 6.3 **Downgrade PPE when appropriate:** As conditions change or additional information is obtained, reselect the PPE from Attachment 9.1 using the new criteria.

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7.0 Implementation and Training

IHG personal who perform emergency response work requiring PPE must meet all training requirements, fit testing, and medical qualification for the JTA of their role.

7.1 Technical Specialist (TEC) and IH Field Support Job Training Assessment

Criteria	Qualifying Standard
Respiratory Protection	OMC Medical Approval for SCBA & APR
	SCBA Class or Web Course
	SCBA Practical
	SCBA (Cairns) Face Piece Fit Test
	APR/PAPR Class or Web Course
	APR Full Face (North 7600) Face Piece Fit Test
Personal Protective Equipment	Web Course <i>Chemical Protective Clothing User Training</i> (HP-OSH-157)
Heat Stress Prevention	Web Course <i>Heat Stress Prevention</i> (TQ-Heatstress)
HazWoper	OSHA HazWoper Section (<i>q.</i>) qualification via OSHA 40-hr.
BNL Emergency Plan	Local Emergency Coordinator (GE-LEC)
	Emergency Planning and Response (GE-ENV-GET)
Chemical Safety	Hazard Communication Training (HP-IND-200)

7.2 IH Lab Support Job Training Assessment

Criteria	Qualifying Standard
BNL Emergency Plan	Emergency Planning and Response (GE-ENV-GET)
Chemical Safety	Hazard Communication Training (HP-IND-200)

8.0 References

- 8.1 Forsberg & Mansdorf: *Quick Reference Guide to Chemical Protective Clothing*, 3rd Ed., 1997.
- 8.2 DOE Guidelines on the Selection of Personal Protective Equipment.

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Document Review Tracking Sheet		
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Filing Code: <div style="text-align: center;">IH52R.</div>	QA Review / Date: 	Effective Date: <div style="text-align: center;">03/02/04</div>

Periodic Review Record		
Date of Review	Reviewer Signature and Date	Comments Attached

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Attachment 9.1

BNL Chemical Protective Clothing Selection Guide Matrix for Chemical HazMat Incident

A. PPE Ensemble Matrix

Contaminant & Concentration	Respirator	Skin Protection	Eye
All Unknown, i.e. • Unknown identity of chemical & • Unknown concentration	Level A: SCBA	Level A: Total Encapsulating Suit	Full Face Mask
• Known Chemical but • Unknown concentration	Level A: SCBA	• Level A: Total Encapsulating if corrosive or penetrates through skin, • Other wise TEC judgment for Level B	Full Face Mask
• Known Chemical & • Known concentration	• Level A: SCBA if >IDLH • Level B: APR/APR if <IDLH	• Level A if skin hazard • Level B if no skin hazard	Full Face Mask

Level A: PPE offering full respiratory and skin protection, specifically a fully encapsulating suit and internal SCBA or Airline respirator. Gloves taped at wrists. Penetration resistance at the feet is supplied by the suit, but it is common for abrasion resistant shoes or boots to be worn outside the suit to protect it while working.

Level B: PPE offering full respiratory protection (external SCBA or Airline respirator) and a high skin protection- full suit with hood and foot covering. Gloves taped at wrist. The suit may or may not include foot covering. If not, penetration resistance at the feet is supplied by taping a impermeable boot to the suit.

Level B-modified: PPE offering full respiratory protection (SCBA, Airline, PAPR, or APR as appropriate) and a limited skin protection- full suit with or without hood. Boots or foot covering. Gloves taped at wrist.

Level C: PPE offering respiratory protection (PAPR or APR if required) and limited skin protection- suit with or without a hood. Gloves typically not taped at wrist. Boots typically not covered.

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Attachment 9.2

Recommended Glove /Suit Material for common BNL chemicals

Chemical Name	Splash level of protection (disposable, exam style)								Immersion Glove (reusable, flocked or fabric support)
	Nitrile (N-Dex) TOTAL IMMERSION						Natural Rubber (Latex Exam)	PVC	
	DEGRADATION (MIN)				PERMEATION (MIN)				
	5	30	60	240	BT	Rate			
Acetaldehyde	NR	NR	NR	NR	NR	NR	NR	NR	E= Butyl, 4H, Teflon
Acetone	NR	NR	NR	NR	NR	NR	NR	NR	E= Butyl, Teflon, 4H
Acetonitrile	P	P	P	P	4		NR	NR	E= Butyl, Teflon, 4H
Acetic anhydride							NR	NR	E= Butyl, Teflon, 4H
Ammonia							NT	NR	E= Butyl, Nitrile, Teflon, Viton
Benzaldehyde	NR	NR	NR	NR	NR	NR	NR	NR	E= Butyl, PVA, Viton, 4H
Benzene	NR	NR	NR	NR	NR	NR	NR	NR	E= PVA, Teflon, Viton, 4H
Carbon tetrachloride	F	NR	NR	NR	NR	NR	NR	NR	E= PVA, Viton, 4H
Chloroform	NR	NR	NR	NR	NR	NR	NR	NR	E= PVA, Viton, 4H, Teflon
DMF	NR	NR	NR	NR	NR	NR	NR	NR	E= Butyl, Teflon, 4H
DMSO	E	G	F	P	23	84	NR	NR	E= Butyl, Neoprene, Teflon, 4H
Ethanol	E	E	E	G	7	12	NR	NR	E= Butyl, Neoprene, Viton, 4H F= Nitrile
Formaldehyde	E	E	E	E	ND	ND	NR	F	E= Butyl, Nitrile, Viton, 4H
Ethyl Acetate	NT	NT	NT	NT	NT	NT	NR	NR	E= PVA, Teflon, 4H F= Butyl
Ethyl ether	G	G	G	G	2	495	NR	NR	E= PVA, 4H, Teflon
Hexane	E	E	E	E	11	8	NR	NR	E= Nitrile, PVA, Teflon, Viton, 4H
Hydrazine							F	G	E= Butyl, Neoprene, Nitrile, PVC
Hydrogen Peroxide 30-70%							G	G	E= Butyl, Nat.Rubber, Nitrile, PVC, Viton, 4H F= Neoprene
Iso-propanol (2-propanol)	E	E	E	E	15	29	NR	F	E= Butyl, Neoprene, Nitrile, Teflon, Viton, 4H
n-Propanol	G	F	P	P	7	42	NR	F	E = Butyl, Teflon, Viton, 4H
Methanol	E	G	G	F	NR	NR	NR	NR	E = Butyl, Neoprene, Nitrile, Teflon, Viton, 4H
Methyl Ethyl ketone (MEK)	NR	NR	NR	NR	NR	NR	NR	NR	E= Butyl, Viton, 4H
Methylene Chloride (dichloromethane)	NR	NR	NR	NR	NR	NR	NR	NR	E= PVA, Teflon, 4H
Trichloroethane, 1,1,1-	NR	NR	NR	NR	NR	NR	NR	NR	E= Butyl, PVA, Viton, 4H
Trichloroethylene	NR	NR	NR	NR	NR	NR	NR	NR	E = PVA, Viton, 4H
Tetrahydrofuran	NR	NR	NR	NR	NR	NR	NR	NR	E= Teflon, 4H
Toluene	NR	NR	NR	NR	NR	NR	NR	NR	E= PVA, Teflon, Viton, 4H
Xylene	NR	NR	NR	NR	NR	NR	NR	NR	E= PVA, Teflon, Viton, 4H

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	Nitrile (N-Dex) TOTAL IMMERSION						Natural Rubber (Latex Exam)			PVC
	DEGRADATION (MIN)				PERMEATION (MIN)					
	5	30	60	240	BT	Rate				
Ammonium Hydroxide 30-70%							NR	P	E= Butyl, Neoprene, Nitrile, Teflon	
Potassium Hydroxide (KOH) 45%	E	E	E	E	ND	ND	F	F	E= Butyl, Nat Rubber, Neoprene, Nitrile, PVC, Teflon, Viton, 4H	
Sodium Hydroxide (NaOH) 50%	E	E	E	E	ND	ND	F	F	E= Butyl, Nat Rubber, Neoprene, Nitrile, PVC, Teflon, Viton, 4H	
Hydrochloric Acid 37%	E	E	E	E	ND	ND	F	F	E= Butyl, Nat Rubber, Neoprene, Nitrile, PVC, Teflon, Viton, 4H	
Phosphoric Acid 85%	E	E	E	E	ND	ND	F	F	E= Butyl, Nat Rubber, Neoprene, Nitrile, PVC, Viton, 4H	
Nitric Acid 30-70%	G	P	NR	NR	NR	NR	NR	F	E= Butyl, Neoprene, Viton, 4H	
Nitric Red Fuming							NR	NR	E= Teflon	
Sulfuric Acid 97%	G	P	NR	NR	NR	NR	NR	F	E= Butyl, Teflon, 4H, Viton	
Acetic Acid 84%	E	P	P	NR	NR	NR	F 1-4 HR	F 1-4 HR	E= Butyl, Neoprene, Viton, 4H	
Mercury- elemental	NT	NT	NT	NT	NT	NT			E = 4H Note: most gloves afford good protection	
NR= not recommended ND= none detectable (permeation) NT = not tested NA = not applicable			E= excellent G = good F = fair P =poor			Butyl = butylenes/isoprene copolymer 4H = Silvershield = (polyethylene/ethylene vinyl alcohol copolymer) Natural rubber = isoprene from <i>gutta percha</i> Neoprene = DuPont trademark for chloroprene PVA= trademane of Ansell for polyvinyl alcohol PVC= polyvinyl chloride Teflon = DuPont trademark for polytetrafluoroethylene (PFTE) Viton = DuPont trademark for hexafluoropropylene/vinylidene fluoride copolvmr				

Source: Best Glove 4/98 Degradation/Permeation Table; *Quick Selection Guide to CPC*, K. Forsberg & S. Mansdorf 3rd ed.

Also base selection of the material of construction for the PPE using:

- Forsberg & Mansdorf: *Quick Reference Guide to Chemical Protective Clothing*, 3rd Ed., 1997.
- DOE Guidelines on the Selection of Personal Protective Equipment.